



Region 3 • District 4 • 2620 N. Commercial Ave • Pasco WA 99301

2004-05 Ringold Springs Hatchery Steelhead Return and Harvest

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Recent History of Ringold Steelhead Fishery

The National Marine Fisheries Service (NMFS) listed Upper Columbia steelhead as an "endangered" species and Snake River wild steelhead as "threatened" in August, 1997 under the Endangered Species Act (ESA) of 1973. Mid-Columbia steelhead, which include Yakima Basin steelhead, were listed in March, 1999, as "threatened". Region 3, District 4 fisheries that potentially impact listed steelhead include the Columbia River steelhead sport fishery, the Hanford Reach fall chinook fishery, Yakima Basin trout and salmon fisheries, and the Columbia River sturgeon, walleye, bass, and panfish fisheries.

With the endangered listing for both hatchery and wild Wells fish (Upper Columbia ESU), adult steelhead returning to the Ringold Springs Rearing Facility (RSRF) are used as an "ESU-reserve stock". This "reserve population" will be used for broodstock purposes in the event the numbers of fish required above Priest Rapids Dam cannot be met due to poor survival or a catastrophic loss. Steelhead reared and released at the RSRF originate from early egg takes at Wells Hatchery. Smolts released from RSRF are adipose and right ventral clipped to identify them as the Ringold steelhead "ESU-reserve" population. Adult steelhead in excess of reserve population broodstock needs provide recreational fishing opportunity in the lower 23 miles of the Hanford Reach and the Tri-cities area of the Columbia River. The fishery boundary area is from the Highway 12/395 Bridge at Pasco (RM 330) upstream to the Old Hanford Townsite powerline crossing (RM 362).

The Ringold area hatchery steelhead fishery was listed as a permanent rule in the Fishing in Washington Sport Fishing Rules in 2003. The fishery is open from October 1 through April 15 of the following year. This fishery has been opened by emergency regulation and with varying start dates in years' prior pending approval from National Oceanographic and Atmospheric Administration (NOAA) Fisheries. This fishery is open for bank and boat angling through March 31, but is restricted to "bank fishing only" from April 1 through April 15 to reduce impacts to ESA listed spring chinook. The boundary area for the bank fishery is from the WDFW marker ¼ mile downstream of the Ringold irrigation wasteway outlet to the marker ½ mile upstream of Spring Creek. Anglers are only permitted to harvest hatchery steelhead with both an adipose fin-clip and a ventral fin-clip. Daily limit is two steelhead. The regulation was modified by emergency regulation in 2004 to allow harvest of any hatchery steelhead from October 1, 2004 through March 31, 2005. An additional emergency regulation was issued in March 2005 allowing harvest of any hatchery steelhead during the bank fishery.

RSRF Hatchery Steelhead Return Estimates

The estimated hatchery return to the RSRF in 2004 was 3,411 steelhead (Table 1). Wells stock steelhead were first released from Ringold Springs in the spring of 1998. The first release was 200,000 smolts from the 1997 brood year. The return of Wells stock steelhead to the RSRF in 1999 was estimated at 3,154, generating an smolt to adult return rate (SAR) of 0.01577 for 1-salt returns. The 1999 return was the only year that a complete enumeration of returns at the facility has occurred. The Ringold facility has released between 80,520 and 210,000 steelhead annually during the seven years it has reared and released Wells stock (Table 2).

Operational procedures at the Ringold facility have not been structured to provide information for the determination of a SAR for 2-salt returns for Wells stock at the facility. Sport fishing surveys conducted prior to the fall of 2001 collected limited information on age composition of the return. For the past four seasons, 2001-02 through 2004-05 fisheries, scale samples have been collected on a minimum of 50% of the steelhead in the creel survey. Based on data from the creel surveys, roughly 21% (range: 4.1% - 27.3%) of the escapement returned to Ringold as 2-salt age steelhead. The 2003-04 season was excluded due to the unusually large component of 1-salt steelhead. Using the 1999 return of 3,154 as a base for calculation of an SAR and an age composition of 0.2133 for 2-salt returns (mean 2001-04 sport fisheries) an estimated 856 age 2-salt steelhead would return for the 1997 brood year, generating an SAR of 0.004278 for the 1999 return. No age 3-salt Wells stock steelhead have been sampled in the sport fishery at Ringold, consequently, no 3-salt steelhead were included in the return estimates.

Table 1. Annual return estimates for Ringold Springs Rearing Facility, 1999-2006.

Year	Estimated Return		
	1-salt	2-salt	Total
2006	1,270	454	1,724
2005	1,674	734	2,408
2004	2,707	704	3,411
2003	2,595	898	3,493
2002	3,312	774	4,086
2001	2,854	774	3,628
2000	2,854	856	3,710
1999	3,154		3,154

Table 2. Juvenile steelhead releases of Wells hatchery steelhead from the Ringold Springs Facility and expected adult returns by Brood Year, 1997 - 2004.

Brood Year	Smolts Released	Expected Return for Broodyear		
		1-salt	2-salt	Total
2004	80,520	1,270	344	1,614
2003	106,147	1,674	454	2,128
2002	171,645	2,707	734	3,441
2001	164,556	2,595	704	3,299
2000	210,000	3,312	898	4,210
1999	181,000	2,854	774	3,628
1998	181,000	2,854	774	3,628
1997	200,000	3,154	856	4,010

Sport Harvest Sampling

Trailer counts and creel interviews were conducted at Ringold, Leslie Groves Park, White Bluffs boat launch, and the Vernita Bridge boat launch from September 2 through October 22, 2004 to estimate catch, harvest, and impacts to ESA listed species during the Hanford Reach fall chinook fishery and the Ringold steelhead fishery in the lower Hanford Reach. After October 22, closing date for the Hanford Reach fall chinook fishery above the wooden powerline towers, sampling was reduced to the Ringold area shorelines and launches. To generate an accurate estimate of total effort, daily sampling was stratified into four separate components: weekday bank anglers, weekday boat anglers, weekend bank anglers, and weekend boat anglers. Angler counts were converted to angler-hours by multiplying the mean hourly angler count by the number of angling hours in a day (Hahn et al 1993). Angling hours was defined as the number of daylight hours. For the month of October, daily boat angler effort was expanded by 25% to account for boats launching from Tri-cities area boat launches that are largely non-sampled. This expansion was decreased to 10% from November through March as angler activity typically drops dramatically after the fall chinook fishery declines and fewer boats launch from the Tri-cities area to fish the Ringold steelhead fishery during the colder months.

Interviews were conducted on 90 of the 197 days of the fishery, October 1 - April 15. A total of 3,158 anglers were interviewed, 1,537 bank anglers and 1,621 boat anglers. Total angler effort for this fishery was estimated at 41,359 pole hours (Table 3). WDFW staff sampled 31.5% of the total estimated angler effort during this fishery. Boat anglers comprised 70% of the total effort during the 2004-05 fishery (Table 4). The months of October and November had the highest estimated angler activity accounting for 84% of the total effort. The increased effort during the first two months of the season can be largely attributed to the Ringold steelhead season coinciding with the Hanford Reach fall chinook fishery. Anglers during these months are largely targeting on fall chinook. There was no effort to segregate anglers by target species due to the large overlap in effort for both species.

Table 3. Estimated total effort, angler hours sampled, and percent of total effort sampled by month during the 2004-05 Ringold steelhead fishery.

Month	Effort (Angler Hours)		
	Hours	Sampled	% Sampled
October	28,202	8,628	30.6%
November	6,535	2,112	32.3%
December	2,644	809	30.6%
January	722	238	33.0%
February	954	354	37.1%
March	1,493	627	30.1%
April	810	244	31.5%
Total	41,359	13,011	31.5%

Table 4. Summary of angler interviews by weekday, weekend, bank, and boat (Oct 1, 2004 - April 15, 2005).

	Type	Interviews		Hours Fished
		Boats	Anglers	
Weekdays	Bank		779	2,116
	Boat	300	736	4,213
	Total	300	1,515	6,329
Weekends	Bank		758	1,827
	Boat	337	885	4,855
	Total	337	1,643	6,682
Combined	Bank	0	1537	3,944
	Boat	637	1621	9,067
	Total	637	3158	13,011

Harvest

A mean estimate of 2,347 steelhead were caught during the 2004-05 Ringold steelhead fishery with a 95% confidence interval of 2,163 to 2,534 (± 186 fish) (Table 5). Harvest was estimated at 1,825 hatchery steelhead with a 95% confidence interval of 1,667 to 1,982 steelhead (± 158 steelhead). This was a 45% decrease in the catch and a 32% decline in harvest compared to the 2003-04 fishery. Catch and effort was highest during October and November. Ringold reared steelhead comprised 88% of the catch and 93% of the harvest. Released steelhead included, 367 adipose + right vent clipped (Ringold) steelhead, 65 adipose only clipped steelhead, and 95 wild steelhead. Harvest was open to any hatchery steelhead during the 2004-05 fishery. In all prior years, harvest was restricted to Ringold origin steelhead only and then modified by emergency regulation to allow harvest of any hatchery steelhead later in the season. The mean catch per unit effort (pole hours) was 0.057 for the 2004-05 fishery, 17.6 hours fished per steelhead. Harvest per unit effort (HPUE) was 0.044 steelhead per pole hour. CPUE was highest in February and March with an average catch for each 6.2 hours of angling. The catch and harvest in 2003-04 was 4,237 caught and 2,698 harvested (Table 6). Though the 2004-05 catch and harvest was well below the 2003-04 fishery, numbers were similar to catch and harvest from the two seasons prior (2002-03 and 2001-02). There were no steelhead reported harvested from boats launching upstream of the fishery boundary (wooden powerline towers).

Table 5. Monthly summary of Ringold steelhead fishery catch and harvest, October 1, 2004 – April 15, 2005.

Month	Total		ADRV		AD Only		Recycle		Wild	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	%
October	1,143	990	1,012	922	92	68	117	115	40	3.5%
November	488	415	445	396	28	19	111	107	15	3.2%
December	174	156	157	148	7	7	27	27	10	5.9%
January	60	19	48	19	4	0	4	4	9	14.6%
February	112	79	89	64	15	15	3	3	8	7.2%
March	240	111	203	96	27	14	6	6	11	4.4%
April	130	55	103	45	25	10	0	0	2	1.8%
Total	2,347	1,825	2,057	1,690	198	133	268	262	95	4.0%

Table 6. Annual season, catch, harvest, and angler effort during Ringold steelhead fishery, 2001-2005.

Year	Season¹	Catch	Harvest	CPUE	HPUE	Est. Pole Hours
2004-05	Oct. 1 – April 15	2,347	1,825	0.057	0.044	41,359
2003-04	Oct. 1 – April 15	4,267	2,698	0.095	0.060	45,070
2002-03	Oct. 12 – April 15	2,036	1,333	0.094	0.062	21,633
2001-02	Nov. 16 – June 15	1,931	1,764	0.116	0.106	16,648

¹ Restricted to bank fishing only after April 1

An estimated 95 wild steelhead were caught and released. Wild steelhead comprised 4.0% of the catch. Based on a hooking mortality rate of five percent, five wild steelhead mortalities were associated with this fishery. Catch and released wild steelhead have ranged from 95 (2004-05) to 212 (2002-03) over the recent four years, with an interception rate of 3.5% (2003-04) to 10.4% (2002-03) of the catch. Mortality due to hook and release associated with this fishery has ranged from 5 to 11 steelhead. WDFW Detachment 19 accumulated over 60 hours towards steelhead/salmon enforcement in the Hanford Reach including several boat patrols between October 2004 and April 2005.

Ringold Springs Rearing Facility Adult Steelhead Transportation Program

The RSRF has not taken any steelhead for egg production in recent years but has operated the facility trap located on Spring Creek to capture and transport steelhead returning to the hatchery. Hatchery staff typically transports and releases all adipose only clipped and wild steelhead at Parking Lot 7 of the Hanford National Monument. This launch is approximately seven miles upstream of the trap and above the upper boundary of the fishery. Ringold origin steelhead (adipose + right ventral fin) are transported and released downstream at boat launches in Kennewick and Richland. All Ringold origin fish captured at the trap have been operculum punched prior to transport and release to identify these fish as having entered the trap. In 2005, any hatchery steelhead was available for harvest in the Ringold area steelhead fishery and all hatchery steelhead were transported downstream. An additional change in protocol was to caudal clipped rather than operculum punch all hatchery steelhead returning to the RSRF in 2004-05. The protocol was changed in an effort to reduce handling time and injuries associated with handling and marking. Steelhead returning more than once received a caudal punch. Caudal clipped fish were recorded during creel sampling in the 2004-05 fishery to evaluate contributions of recycled fish to the overall harvest.

A total of 800 steelhead (including recaptures) were transported and released in the Tri-cities between October and December of 2004 (Table 7). These consisted of 521 Ringold origin steelhead and 80 adipose only steelhead. Of the 521 Ringold steelhead captured at the hatchery trap, 142 were recaptured at least once (27%) and 23 of the 80 (29%) adipose only steelhead were recaptured a minimum of one additional time. No wild steelhead were captured during capture operations at the RSRF trap in 2004.

An estimated 268 recycled steelhead were caught during the 2004-05 fishery and 262 were harvested, 43.6% of the fish caudal clipped were harvested (Table 8). The harvest of Ringold origin recycled steelhead for the 2004-05 fishery was estimated at 259 steelhead, 50% of the

Ringold steelhead marked. Catch rates were likely higher than estimated for recycled steelhead. Anglers will typically note the absence of the adipose fin but are less likely to notice or be aware of caudal clipped steelhead in the fishery. If catch rates for recycled steelhead were similar to catch and harvest rates in general, the recycled catch was roughly 337 fish. Based on these estimates, 56% of the recycled fish were caught and recycled fish comprised 14.4% of the overall catch and harvest for this fishery. Only one marked (caudal clip) adipose only clipped steelhead was harvested in the fishery though 80 adipose only clipped steelhead were caudal clipped during the transportation program.

Table 7. Summary of adult steelhead collected and marked at the RSRF, 2004.

Day & Month	Total (All)	Totals (recycle)			1X			2X		3X		4X		Other	
		Wild	Ad Rv	Ad only	Wild	Ad Rv	Ad only	Ad Rv	Ad only	Ad Rv	Ad only	Ad Rv	Ad only	Mort	Misc
Oct 20	241	0	230	11		230	11								
Oct 22	149	0	123	25		123	25								1
Oct 26	248	0	202	46		114	36	86	9	2	1				
Total	638	0	555	82	0	467	72	86	9	2	1	0	0	0	1
Nov 12	83	0	71	12		28	3	31	7	12	2				
Nov 24	57	0	48	9		22	5	13	3	7	1	6			
Total	140	0	119	21	0	50	8	44	10	19	3	6	0	0	0
Dec 22	40	0	19	4		4		12	4	3	0	0		17	
Total	40	0	19	4	0	4	0	12	4	3	0	0	0	17	0
Total	818	0	693	107	0	521	80	142	23	24	4	6	0	17	1

Table 8. Monthly summary of steelhead transported from the RSRF and associated catch and harvest in the fishery, 2004-05.

Month	Steelhead Transported			Recycled Steelhead		
	Upstream	Downstream		Catch	Harvest	Harvest ¹ (%)
		New	Repeat			
October	0	539	98	117	115	21.3%
November	0	58	82	111	107	17.9%
December	0	4	19	27	27	4.5%
January				4	4	0.7%
February				3	3	0.5%
March				6	6	1.0%
April				0	0	0.0%
Totals	0	601	199	268	262	43.6%

¹ Percentage of recycled fish harvested that were available in the fishery.

Ringold Steelhead Age and Growth

A total of 562 steelhead were sampled during the 2004-05 Ringold steelhead fishery, 31% of the estimated harvest. Information on length, gender, and clips was collected from all steelhead observed during creel interviews. Scale samples were collected in a ratio of 1 in 2, resulting with the collection of 280 scale samples. Only two of the scale samples collected were unreadable and 18 hatchery steelhead were non-Ringold origin fish (adipose clip only). The majority of the

steelhead harvested in this fishery were 1-salt steelhead (73%), having spent one year in fresh water and one year in the ocean before returning to the Columbia River (Table 9 & Figure 1). No 3-salt fish were sampled and no steelhead had spent more than one year rearing in fresh water. No 3-salt steelhead have been sampled in this fishery since the Ringold Springs Rearing Facility began rearing and releasing Wells stock steelhead (1998). One salt steelhead ranged in size from 48cm to 73cm with an average length of 61cm and were evenly split between males and females. Two salt steelhead averaged 74cm, range 65cm – 82cm, and had a higher percentage of females with a female to male ratio of 68:32. Overall female composition of the harvest was 55%. Gender composition of the catch may be slightly biased towards females as some anglers target on female steelhead to procure eggs for bait. No coded wire or radio tagged fish were sampled in 2004-05 but two PIT tagged steelhead were recovered. Both tagged fish were Ringold origin steelhead, part of research conducted by NOAA Fisheries.

Table 9. Age and gender composition of hatchery steelhead harvested in the Ringold fishery, 2004-05.

	1 salt		2 salt		Total	
	#	%	#	%	#	%
Male	94	49.7%	23	32.4%	117	45.0%
Female	95	50.3%	48	67.6%	143	55.0%
Total	189	72.7%	71	27.3%	260	

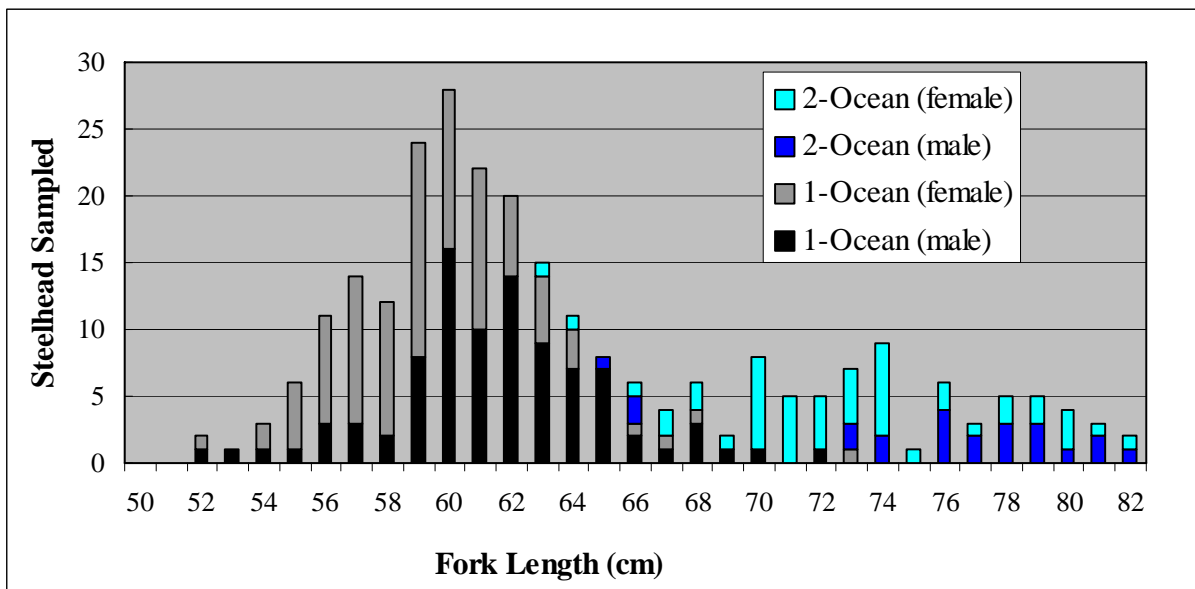


Figure 1. Length frequency and age of hatchery steelhead harvested in the Ringold fishery, October 1, 2004 – April 15, 2005.

Summary

The WDFW District 4 biologist currently forecasts the estimated return of hatchery steelhead to the Ringold Springs Rearing Facility using SARs (smolt adult return ratios) determined from the 1999 hatchery return. Steelhead returns have increased dramatically since 1999 for the Columbia, Snake, and Yakima River systems. There have been attempts to adjust the Ringold return estimates based on pre-season forecasts for these systems and in-season passage through the fish ladders of Bonneville, McNary, Ice Harbor, and Priest Rapids hydroelectric projects. Unfortunately, the Ringold return does not appear to track well with these predictions or passages. Steelhead passage through Priest Rapids is somewhat correlated but the relation is not significant to warrant adjusting pre-season estimates. The use of ladder counts to estimate the Ringold return (+ McNary - Ice Harbor - Prosser - Priest Rapids = Ringold) produces wildly variable and unlikely return estimates; 111,000, 67,000, 24,000, and 10,000 for the past four years, 2001 to 2004 respectively.

The current method to predict hatchery steelhead returns to the Ringold Facility using the SAR from the 1999 Wells Ringold return does appear to provide a reasonable estimate of returns to Ringold for three of last four years (Figures 2, 3, and 4). In 2003, there was an unusually high return of 1-salt steelhead and relatively low return of age 2-salt. The post fishery estimate of the return is based on an estimated harvest of 51% of the return, mean proportion of harvest to estimated return for 2001-02, 2002-03, and 2004-05, range 0.49 - 0.54. The harvest of marked (caudal clipped) recycle Ringold origin steelhead was 50% of the marked population during the 2004-05 fishery providing some additional indication that anglers are effective in harvesting roughly 50% of the available steelhead. This method does tend to overestimate the population of 2-salt steelhead.

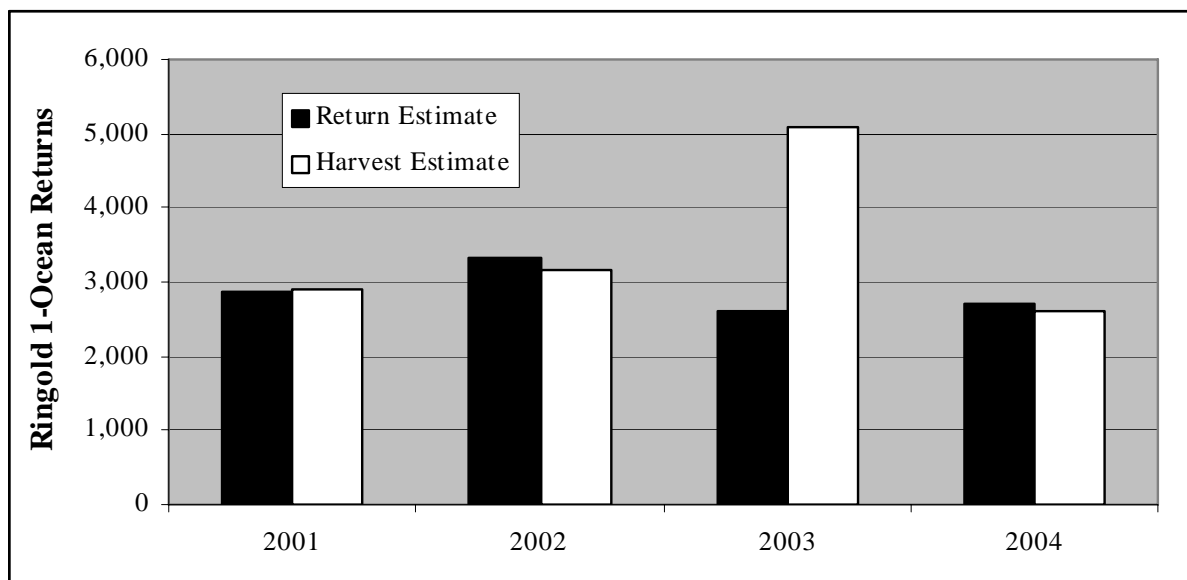


Figure 2. Estimated 1-Ocean steelhead returns to Ringold Springs RF by SAR and from harvest, 2001-04.

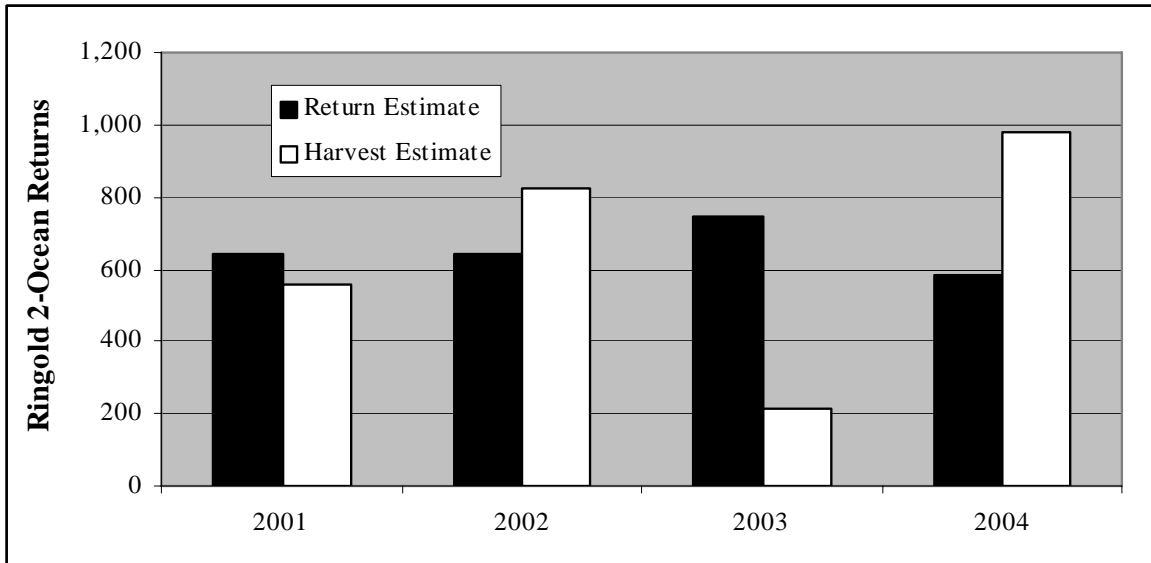
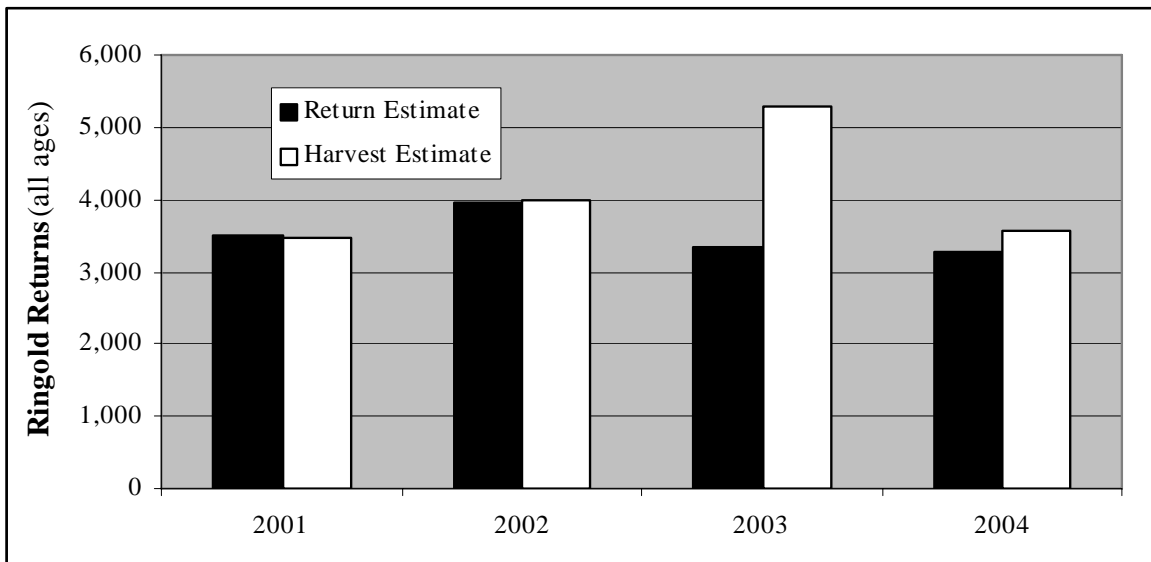


Figure 3. Estimated 2-Ocean steelhead returns to Ringold Springs RF by SAR and from harvest, 2001-04.

Figure 4. Estimated steelhead returns to Ringold Springs RF by SAR and from harvest, 2001-04.



In general, catch, harvest, and effort during the 2004-05 Ringold steelhead fishery were lower than the 2003-04 fishery. The 2004-05 catch and harvest were similar though slightly higher than the 2001-02 and 2002-03 fisheries. The estimated 2,347 steelhead caught during the 2004-05 season was the second highest recorded catch of steelhead for the Ringold fishery since Wells stock Upper Columbia steelhead were reared at the RSRF (Table 10). Harvest during the 2004-05 season was just below the mean recorded over the past 13 years (1992-2005, mean = 1,973). Angler effort (pole hours) was only slightly lower than the 2003-04 fishery but remained well above the two prior years fisheries. The increase in angler activity over the last two seasons can be attributed to the earlier opening of the steelhead fishery in 2003 and 2004 and the recent increase in the number of boat anglers utilizing the Ringold launch. The earlier opening on October 1 also coincides with the peak of angler activity for the Hanford Reach fall chinook

fishery. No effort was made to separate fall chinook and steelhead anglers as most anglers were fishing for both species. Catch and harvest was highest during October, November, and March but the fishery provided good angling opportunity throughout the winter months.

Table 10. Estimated harvest of steelhead during the Ringold fishery, 1992-2005.

Wells Stock		Skamania Stock	
Fishery	Harvest	Fishery	Harvest
2004-05	1,825	1999	620
2003-04	2,698	1998	615
2002-03	1,333	1997	1,303
2001-02	1,764	1996	1,678
2000*	546	1995	3,614
		1994	2,276
		1993	3,742
		1992	3,634

Mean fork length of harvested steelhead was 64 cm in the 2004-05 harvest, above the 2003-04 mean but still smaller than the 2001-02 and the 2002-03 steelhead harvest even though the 2-salt component of the harvest was higher in 2004-05 (Table 11). The age composition and female to male ratio was similar to the 2001-02 and 2002-03 harvest with 1-salt steelhead comprising roughly three-quarters of the return and 2-salt steelhead having a higher proportion of females. Length frequency trends were similar to the 2003-04 fishery with smaller mean fork lengths for steelhead in both age groups compared to the 2001-02 harvest. Steelhead appear to be returning at a smaller size beginning with the 2000 brood year (1-salt returns in 2002, 2-salt returns in 2003). Minimum and maximum fork length by age has declined over the past three years with a larger proportion of steelhead of smaller fork length for both ages. In this fishery, 1-salt steelhead returning to Ringold were typically less than 70cm and two salt steelhead were most abundant at 70cm and larger in length (Figure 1).

Table 11. Length, age, gender composition of hatchery steelhead harvested in the Ringold fishery, 2001 – 2005.

Year	2004-05	2003-04	2002-03	2001-02
Number Sampled	260	635	232	181
Length				
1-Salt (mean: range)	61 cm : 48-73	62 cm : 50-73	63 cm : 47-79	66 cm : 55-78
2-Salt (mean: range)	74 cm : 65-82	72 cm : 65-80	78 cm : 69-87	76 cm : 70-89
Overall	64 cm	62 cm	66 cm	68 cm
Age Composition				
1-Salt (%)	72.7%	95.9%	79.3%	84.0%
2-Salt (%)	27.3%	4.1%	20.7%	16.0%
Gender Composition				
1-Salt (% female)	50.3%	44.2%	42.9%	47.4%
2-Salt (% female)	67.6%	48.0%	72.9%	75.9%
Overall	55.0%	44.3%	49.1%	51.9%

Monitoring during the Ringold area steelhead fishery is funded primarily through WDFW

general funds from Region 3 steelhead management. Creel interviews at Vernita Bridge, White Bluffs, and Leslie Groves during the Hanford Reach fall chinook fishery is provided and funded by the Region 5 Coded Wire Tag Recovery Program.